



**Project Update
Estabrook Elementary School
Lexington, Massachusetts
September 16, 2010**

Indoor Air

- Levels of polychlorinated biphenyls (PCBs) in indoor air have decreased following removal of caulk around the window frame and increased ventilation with outdoor air.
- Many rooms sampled on September 6, 2010, were below the public health targets suggested by U.S. Environmental Protection Agency (EPA) (Table 1).
- Additional increases in delivery of outdoor air were made on Saturday, September 11, 2010 (Table 2).
- Interior caulk containing PCBs identified on September 8-9, 2010, has been encapsulated, thereby preventing direct contact and likely reducing emissions to indoor air.
- The room-facing side of ceiling tiles was identified as a probable secondary source of emissions to indoor air. Potential contributions from this source are being evaluated.
- Indoor air samples were collected on September 12, 2010, to evaluate effects of encapsulating interior caulk and further adjustments to outdoor air ventilation
 - Four air samples in rooms with previous air sample results and recent encapsulation (Rooms 2, 5, 21A, 39C)
 - Two air samples in rooms with previous air sample results, encapsulation and unit ventilator dampers set to reflect winter conditions (Rooms 13 and 24)
 - One air sample in the new addition (Room 26)
 - One quality assurance sample (media blank); method precision will be assessed using duplicate sample results during previous sampling; outdoor air concentrations will be assessed using recently obtained outdoor air samples at the school

Recent Bulk and Surface Sample Results

- No indication of additional interior primary sources (Table 3)
- PCBs detected at levels greater than 50 parts per million (>50 ppm) in the green cove base and associated mastic (Table 3)
 - Wipe test samples will be taken on surface of cove base material
 - Plans are being developed to address the cove base material
- Exterior caulking around green panels contained PCBs at levels similar to caulking on interior of same panels (Table 3)
 - Fence around building has limited direct access to this caulk
 - Plans are being developed to encapsulate this caulking
- Waterproofing mastic on the exterior of the building has elevated PCB concentrations; material is inaccessible (Table 3)
- Desktop samples did not contain detectable levels of PCBs (Table 4)

Site-Specific Risk Assessment

- Based upon region-specific, school-specific, and updated dietary inputs (Tables 7 and 8). Electronic file was distributed to advisory panel on September 14, 2010.
- Considers EPA Reference Dose for two commercial mixtures of PCBs, Aroclor 1254 and Aroclor 1016 (Figure 2)
- Results compared to indoor air levels measured on September 6, 2010 (Figure 3)

Table 1 Air Sample Results for Polychlorinated Biphenyls as Homologs, Estabrook Elementary School, 117 Grove Street, Lexington, Massachusetts, July 22, 2010 – September 6, 2010*

Sample Location	Total PCBs (ng/m ³)		
	Round 1 ^a	Round 2 ^b	Round 3 ^c
Room 1	299	426	118
Room 2	–	775	455
Room 5	459	736	320
Room 6	1,800	764	483
Room 7A	–	–	5.19
Room 13	319	340	184
Room 21A	–	–	410
Room 24	680	601	226
Room 31A	562	575	444
Room 39B	–	419	–
Room 39C	342	495	245
Library	–	469	196
Art Room	–	–	194
Teacher Work Room	–	–	138
Basement	–	–	227
Ceiling plenum (39C)	–	–	562
Outdoors	<3.79	<5.00	<4.20

PCB polychlorinated biphenyl
ng/m³ nanograms per cubic meter
– air sample not collected at that location
< less than

^a Round 1 samples collected July 22, 2010, during summer conditions.

^b Round 2 samples collected on August 25, 26 or 27, 2010, following removal of caulk around exterior window frame.

^c Round 3 samples collected on September 6, 2010, following initial optimization of outdoor air delivery and central exhaust.

* PCB concentration analysis performed by Alpha Analytical Inc., using U.S. Environmental Protection Agency (EPA) Method 10A (GC/MS-SIM).

Table 2 Outdoor Air Ventilation (cubic feet per minute) Measured in Rooms with Unit Ventilators at Estabrook Elementary School, 117 Grove Street, Lexington, Massachusetts, September 5 and September 11, 2010

Sample Location	Ventilation Rate ^a (cfm)	
	Initial Optimization of OA Delivery	Additional Optimization of OA Delivery
Room 1	540 ^b	620
Room 2	390 ^c	520
Room 3	580	560
Room 4	— ^c	500
Room 5	690	520
Room 6	<100 ^c	600
Room 11	480	930
Room 13	890	820
Room 19	900	900
Room 21A	440	440
Room 22	540	520
Room 23	— ^c	560
Room 24	520	470
Room 25	620	560
Room 26	100 ^c	320
Room 27	— ^c	350
Room 31A	— ^d	540
Room 31B	190	520
Room 39B	— ^c	520
Room 39C	460	480
Teacher's Work Room	520	420
Library	2,190	2,300

cfm cubic feet per minute
 OA outdoor air
 < less than

- ^a Operating at full outdoor air delivery unless noted otherwise
^b Temporary, supplemental outdoor air delivery in room (1,200 cfm)
^c Unit not fully operational
^d Unit not operational at all times; 600 cfm when operating



Figure 1a Primary Source Caulking on Interior Panel within Window Frame



Figure 1b Suspected Secondary Source, Ceiling Tiles

Table 3 Bulk Sample Results for Polychlorinated Biphenyls from Estabrook Elementary School, 117 Grove Street, Lexington, Massachusetts, as of September 16, 2010

Building Material	Description	Total PCBs ^{1,2} (ppm _w)
Ceiling Tile	Room 39C, standard new type, full core	4.5
	Room 39C, shiny new type, yellow fiberglass back	8.9
	Room 6, white tile, smooth new type, room-side face/coating	14.3
	Room 6, white tile, standard new type, room-side face/coating	18.3
	Room 39C, old type, full core	78
		122 (duplicate)
	Room 6, white tile, shiny new type, room-side face/coating	141
	Room 6, white tile, old type, room-side face/coating	530
		970 (duplicate)
	Room 6, spaghetti board above drop ceiling	15
		16 (duplicate)
	Room 39C, black adhesive in plenum	3.8
Cove Base	Room 6, green cove base under windows	160
	Room 6, green cove base with mastic	170
	Room 36B, green cove with black mastic	140
	Room 6, cove base isolated from mastic	120
	Room 6, mastic isolated from cove base	280
Flooring	Hallway, black mastic under tile floor, outside room 19	13
Caulking	Hallway, interior caulk adjacent to exit, outside room 19	450
	Room 39B, interior caulk joint, adjacent panel to ventilator	1,830
	Room 6, interior caulk joint	29,400
Insulation	Room 39C, fiberglass insulation	BRL <4.3
	Room 6, insulation paper with clear adhesive	6.1
Exterior Materials	Room 19, exterior corner, black paper under brick with black tar backing	3.9
		3.3 (duplicate)
	Room 19, exterior corner, black paper under brick with black tar backing	1.1*
	Exterior, tar paper membrane, outside room 19 exit	2.8
		4.7 (duplicate)
	Exterior, waterproofing mastic, outside room 6	3,000
	Exterior caulking around green panels	9,700

PCB polychlorinated biphenyl
ppm_w parts per million by weight
BRL below reporting limit
< less than

¹ PCB concentration analysis performed by Groundwater Analytical, Inc., using U.S. Environmental Protection Agency (EPA) Method 8082 (GC/ECD). Aroclor 1016, 1221, 1232, 1242, 1248, 1254 and 1260 tested.

² Aroclor 1016, 1221, 1232, 1248, 1254 and 1260 also tested. All results below reporting levels, unless noted.

Table 4 Wipe Sample Results for Polychlorinated Biphenyls from Estabrook Elementary School, 117 Grove Street, Lexington, Massachusetts, September 7, 2010

Sample ID	Description	Aroclor 1248 ^{1,2} (µg/100cm ²)
115024	Room 39C, student desk	BRL <1
115025	Library, computer table under smartboard	BRL <1
115026	Duplicate 115025	BRL <1
115027	Field blank	BRL <1
115028	Room 31A, student desk	BRL <1
115029	Room 6, student desk	BRL <1
115030	Room 5, student desk	BRL <1
115031	Room 1, play table	BRL <1
115032	Room 2, activity table	BRL <1
115033	Art room, red table	BRL <1
115034	Room 13, student desk	BRL <1
115035	Room 21A, brown semi-circle table	BRL <1
115036	Room 24, student desk	BRL <1

µg/100cm² micrograms per 100 square centimeters
 BRL below reporting limit
 < less than

¹ PCB concentration analysis performed by Groundwater Analytical, Inc., using U.S. Environmental Protection Agency (EPA) method 8082 (GC/ECD).

² Aroclor 1016, 1221, 1232, 1242, 1254, and 1260 also tested. All results below reporting levels, unless noted.

Table 5 Comparison of EPA Reference Dose for Aroclor 1254 and Aroclor 1016

	Aroclor 1254^a	Aroclor 1016^b
NOAEL	None	0.007 mg/kg-day
LOAEL	0.005 mg/kg-day	0.028 mg/kg-day
Endpoint	Ocular exudate, inflamed and prominent Meibomian glands, distorted growth of finger and toe nails; IgG and IgM antibodies in response to SRBC were reduced after 23 months of exposure but only the IgM antibodies were clearly decreased after 55 months.	Adult monkeys that ingested 0.007 or 0.028 mg/kg-day doses of Aroclor 1016 for approximately 22 months showed no evidence of overt toxicity. Effects occurring in the offspring of these monkeys consisted of hairline hyper-pigmentation at greater than or equal to 0.007 mg/kg-day, and decreased birth weight and possible neurologic impairment at 0.028 mg/kg-day. ^d
Uncertainty Factors	300 Total 3 (Inter-species) 10 (Sensitive sub-populations) 10 (LOAEL instead of NOAEL)	100 Total 3 (Sensitive sub-populations) 3 (Inter-species) 3 (Limitations of data) 3 (subchronic to chronic)
RfD (Oral)	0.00002 mg/kg-day (20 ng/kg-day)	0.00007 mg/kg-day (70 ng/kg-day)
Confidence in Oral RfD	Study—medium Database—medium RfD—medium	Study—medium Database—medium RfD—medium

EPA U.S. Environmental Protection Agency
 NOAEL no observed adverse effect level
 LOAEL lowest observed adverse effect level
 mg/kg-day milligrams per kilograms per day
 RfD reference dose
 ng/kg-day nanograms per kilograms per day

^a EPA Integrated Risk Information System (IRIS). Aroclor 1254 (CASRN 11097-69-1). Accessed September 16, 2010. <http://www.epa.gov/iris/subst/0389.htm>

^b EPA Integrated Risk Information System (IRIS). Aroclor 1016; CASRN 12674-11-2. Accessed September 16, 2010. <http://www.epa.gov/iris/subst/0462.htm>

^c Principal and Supporting References for Oral RfD for Aroclor 1254:

Arnold DL, Bryce F, Stapley R, et al. 1993a. Toxicological consequences of Aroclor 1254 ingestion by female Rhesus (*Macaca mulatta*) monkeys, Part 1A: Prebreeding phase - clinical health findings. *Food Chem. Toxicol.* 31: 799-810.

Arnold DL, Bryce F, Karpinski K, et al. 1993b. Toxicological consequences of Aroclor 1254 ingestion by female Rhesus (*Macaca mulatta*) monkeys, Part 1B: Prebreeding phase - clinical and analytical laboratory findings. *Food Chem. Toxicol.* 31: 811-824.

Tryphonas H, Hayward S, O'Grady L, et al. 1989. Immunotoxicity studies of PCB (Aroclor 1254) in the adult rhesus (*Macaca mulatta*) monkey - preliminary report. *Int. J. Immunopharmacol.* 11: 199-206.

Tryphonas H, Luster MI, Schiffman G, et al. 1991a. Effect of chronic exposure of PCB (Aroclor 1254) on specific and nonspecific immune parameters in the rhesus (*Macaca mulatta*) monkey. *Fund. Appl. Toxicol.* 16(4): 773-786.

Tryphonas H, Luster MI, White KL, et al. 1991b. Effects of PCB (Aroclor 1254) on non-specific immune parameters in Rhesus (*Macaca mulatta*) monkeys. *Int. J. Immunopharmacol.* 13: 639-648.

^d Principal and Supporting References for Oral RfD for Aroclor 1016:

Barsotti DA and van Miller JP. 1984. Accumulation of a commercial polychlorinated biphenyl mixture (Aroclor 1016) in adult rhesus monkeys and their nursing infants. *Toxicology.* 30: 31-44.

Levin ED, Schantz SL and Bowman RE. 1988. Delayed spatial alternation deficits resulting from perinatal PCB exposure in monkeys. *Arch. Toxicol.* 62: 267-273.

Schantz SL, Levin ED, Bowman RE, et al. 1989. Effects of perinatal PCB exposure on discrimination-reversal learning in monkeys. *Neurotoxicol. Teratol.* 11: 243-250.

Schantz SL, Levin ED and Bowman RE. 1991. Long-term neurobehavioral effects of perinatal polychlorinated biphenyl (PCB) exposure in monkeys. *Environ. Toxicol. Chem.* 10: 747-756.

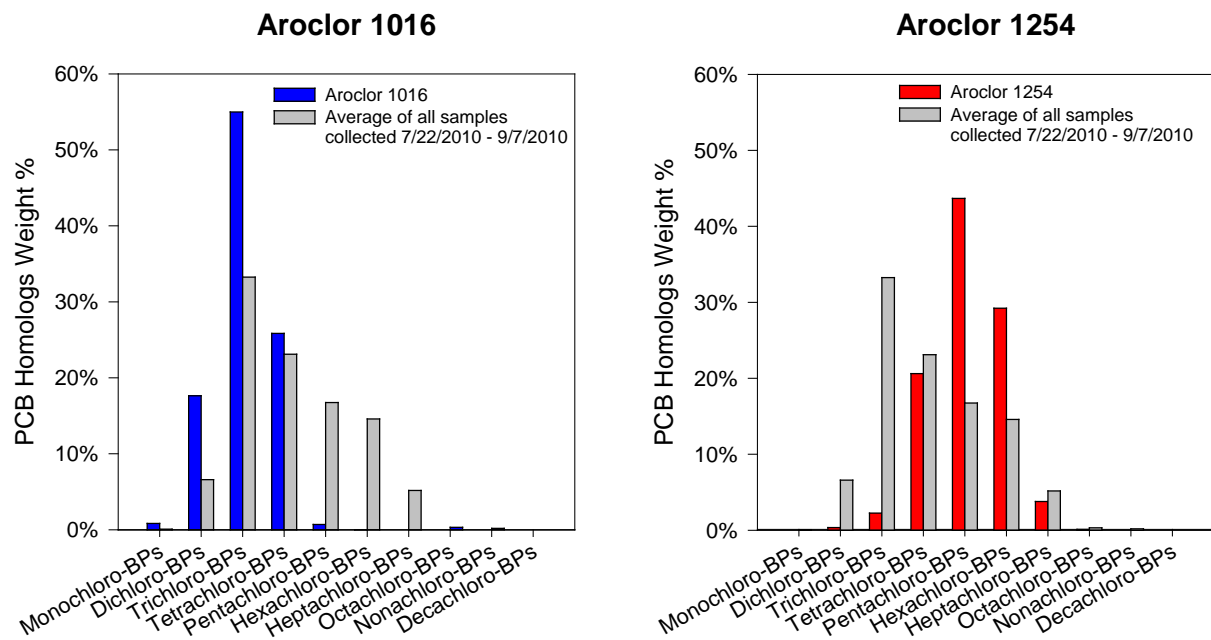


Figure 2 Profiles of Indoor Air Homologs versus Commercial Mixtures of Aroclor 1254 and 1016

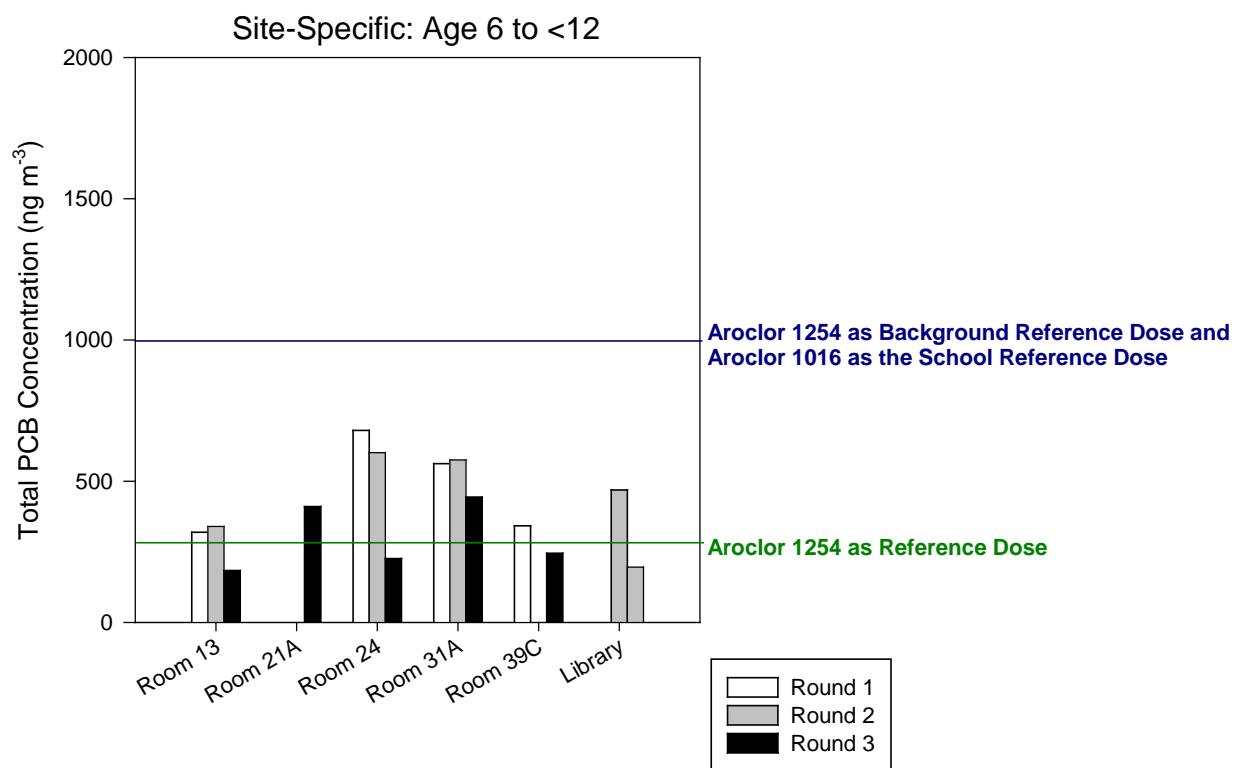
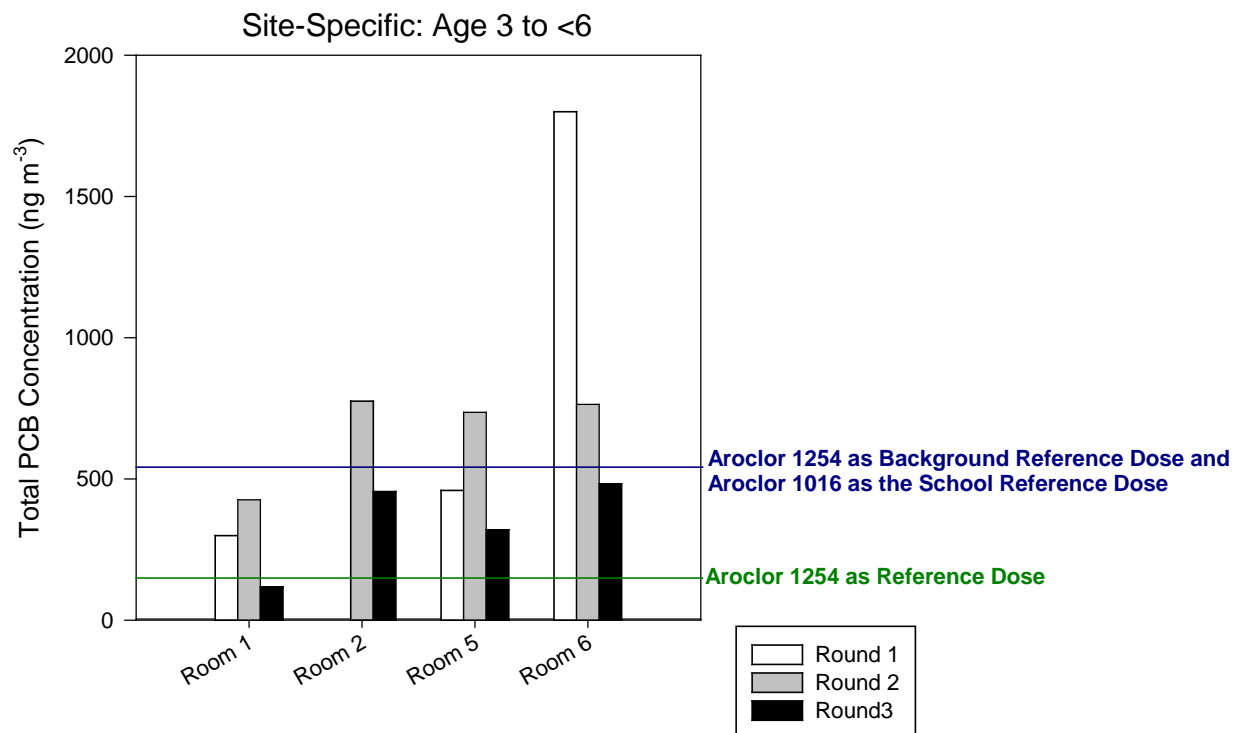


Figure 3 Indoor Air PCB Concentrations Measured in Estabrook School and Site-Specific Public Health Targets Derived from Reference Doses for Aroclor 1254 and Aroclor 1016

Table 6 Comparison of EPA Risk Guidance Values and Site-Specific Risk Values for Estabrook Elementary School, 117 Grove Street, Lexington, Massachusetts

Exposure Scenario	Benchmarks	Units	EPA Inputs			Site-Specific Inputs			
			Pre-school (3 to <6)	Elementary (6 to <12)	Staff (Adult)	Pre-school (3 to <6)	Pre-school with Extended Day Program (3 to <6)	Elementary (6 to <12)	Staff (Adult)
Background Exposure									
Long-term	Background	ng/kg-day	11.8	5.4	3.1	8.1	7.7	5.1	3.3
Aroclor 1254 as Reference Dose									
Reference Level	EPA RfD	ng/kg-day	20	20	20	20	20	20	20
Long-term	School Indoor	ng/m ³	114	303	453	151	107	282	422
Short-term	Air PCB Screening Level	ng/m ³	423	1,126	2,538	764	369	946	2,240
Aroclor 1254 as the Background Reference Dose and Aroclor 1016 as the School Indoor Air Reference Dose									
Reference Level	EPA RfD	ng/kg-day	29	51	59	43	45	53	59
Long-term	School Indoor	ng/m ³	403	1,064	1,586	541	389	998	1,480
Short-term	Air PCB Screening Level	ng/m ³	3,023	7,976	13,022	4,320	2,935	7,466	11,979
<div>EPA < ng/kg-day RfD PCB ng/m³ U.S. Environmental Protection Agency less than nanograms per kilogram per day reference dose polychlorinated biphenyl nanograms per cubic meter</div> <div>¹ Long-term exposure scenario assumes entire school year</div> <div>² Short-term exposure scenario assumes 20 days of exposure at school indoor air PCB target level and remainder of school year at levels below screening levels suggested by EPA</div>									

Table 7 Summary of Selected Inputs to Screening Level Calculations										
Parameter	Unit	EPA Default Values			Estabrook School Specific Values				EPA Assumptions	Estabrook School Assumptions
		Pre-school (3 to <6)	Elementary (6 to <12)	Staff (Adult)	Pre-school (3 to <6)	Pre-school with Lextended Day Program (3 to <6)	Elementary (6 to <12)	Staff (Adult)		
C _{air-indoor}	ng/m ³	6.9			10				Mean total PCB concentration (sum of PCBs containing 3 to 7 chlorines) in air from 10 homes in Toronto, Canada was 6.9 ng/m ³ (range = 1.1 to 14.4 ng/m ³ ; 95th percentile = 14.2 ng/m ³)(Harrad et al., 2009).	Geometric mean total PCB concentration (sum of 65 congeners) in outdoor air samples (n=16) collected from homes in Dartmouth and New Bedford Downtown, MA was 10 ng/m ³ ; range was 5.2 to 51 ng/m ³ (Vorhees et al., 1997).
C _{air-outdoor}	ng/m ³	0.5			0.6				Harrad et al. (2009) estimated the average total PCBs in outdoor air in Toronto, Canada to be 0.51 ng/m3 (range = 0.1 to 1.4 ng/m3; 95th percentile = 1.2 ng/m3).	Geometric mean total PCB concentration (sum of 65 congeners) in outdoor air samples (n=20) collected from homes in Dartmouth and New Bedford Downtown, MA was 0.6 ng/m ³ ; range was 0.1 to 8.2 ng/m ³ (Vorhees et al., 1997).
C _{dust}	µg/g	0.22			0.69				Mean total PCB concentration (sum of PCBs containing 3 to 7 chlorines) in dust samples collected from 20 homes in Austin, TX was 0.22 ug/g; range was 0.047 to 0.62 ug/g and 95th percentile value was 0.52 ug/g (Harrad et al., 2009). The profile indicated that PCBs 1254, 1260, and 1242 dominated.	Geometric mean total PCB concentration (sum of 65 congeners) in dust samples (n=15) collected from homes in Dartmouth and New Bedford Downtown, MA was 0.69 ug/g; range was 0.26 to 3.6 ug/g and median value was 0.71 ug/g (Vorhees et al., 1999).
C _{soil}	µg/g	0.05			0.06				Urban background concentration of PCBs in soils (0.05 ug/g) based on samples collected from parks in Helsinki, Finland (concentration in Tampere, Finland parks was 0.025 ug/g)(Priha et al., 2005). Data for U.S. background concentrations are limited.	Geometric mean total PCB concentration (sum of 65 congeners) in yard soil samples (n=16) collected from homes in Dartmouth and New Bedford Downtown, MA was 0.06 ug/g; range was 0.015 to 0.29 ug/g and median value was 0.062 ug/g (Vorhees et al., 1999).
Diet	µg/kg-day	8.0E-03	3.0E-03	2.0E-03	1.9E-03	1.9E-03	1.2E-03	1.7E-03	Based on FDA total diet study for foods collected in 1997 in ATSDR (2000).	Calculated based on FDA total diet study for food collected in 2003.
School Days	days/yr	180	180	185	182	182	182	184	The assumed exposure duration for children ages 3 to <19 is 180 days/year; 185 days/year is assumed for teachers/staff and daycare children; upper range may be 208 days/years for staff and daycare. Based on NCES (2009) data for 2006, the minimum number of days in school as required by States having such requirements, ranges from 160 to 187 days/year, with 180 days/year being the most common requirement (30 of 44 States). It is reasonable to assume that some schools run summer camp programs and the days spent at school for some children and staff may be as high as 240 days (180 + 60 days of summer camp). Mean total time in school (ETst) was assumed to be 6.5 hours/day for school age children and pre-school age (3 to <6 years) and 8 hours/day for adults and daycare toddlers (ages 1 to <3 years). Times spent attending school full-time from U.S. EPA (2008; Table 16-16) are 6.4, 6.1, 6.5, 6.7, and 5.8 hours/day for children ages 2 to <3, 3 to <6, 6 to <11, 11 to <16, and 16 to <21 years, respectively. Upper percentile (95th) values for these age groups of children are 10.5, 9.7, 8.3, 8.1, and 8.7 hours/day, respectively. The assumption of 6.5 hours/day appears to be supported by data provided by NCES (2009) for the minimum required length of hours/year in school by state. Among the states with such requirement, the highest is 1,137 hours/year or 6.3 hours/day, assuming 180 days/year in school (average for all states is a minimum time in school of 5.5 hours/day, assuming 180 days/year).	Based on survey conducted at Estabrook School.
School Hours	hr/day	6.5	6.5	8	7	10.1	7	8.5		
Indoor at school	hr/day	6	6	8	6.5	9.4	6.5	8.5		
Outdoor at school	hr/day	0.5	0.5	0	0.5	0.7	0.5	0	Estimated as the sum of indoor (Etsi) and outdoor time (Etso) at school.	
EPA C ng/m ³ µg/g µg/kg-day	U.S. Environmental Protection Agency concentration nanograms per cubic meter micrograms per gram micrograms per kilogram per day									



Table 8 FDA Total Diet Study 2003—PCB Concentration in Each Food

Food No.	Food Description	PCB Concentration (ppm)			
		Study Period 1	Study Period 2	Study Period 3	Study Period 4
1	Milk, whole, fluid	<DL	<DL	<DL	<DL
2	Milk, lowfat (2%), fluid	<DL	<DL	<DL	<DL
3	Milk, chocolate, lowfat, fluid	<DL	<DL	<DL	<DL
4	Milk, skim, fluid	<DL	<DL	<DL	<DL
7	Milk shake, chocolate, fast-food	<DL	<DL	<DL	<DL
10	Cheese, American, processed	<DL	<DL	<DL	<DL
12	Cheese, cheddar, natural (sharp/mild)	<DL	<DL	<DL	<DL
13	Beef, ground, regular, pan-cooked	<DL	<DL	<DL	<DL
14	Beef roast, chuck, oven-roasted	<DL	<DL	<DL	<DL
17	Ham, cured (not canned), baked	<DL	<DL	<DL	<DL
18	Pork chop, pan-cooked w/ oil	<DL	<DL	<DL	<DL
19	Pork sausage (link/patty), oven-cooked	<DL	<DL	<DL	<DL
20	Pork bacon, oven-cooked	<DL	<DL	<DL	<DL
21	Pork roast, loin, oven-roasted	<DL	<DL	<DL	<DL
22	Lamb chop, pan-cooked w/ oil	<DL	<DL	<DL	<DL
26	Turkey breast, oven-roasted	<DL	<DL	<DL	<DL
27	Liver (beef/calf), pan-cooked w/ oil	<DL	<DL	<DL	<DL
28	Frankfurter (beef/pork), boiled	<DL	<DL	<DL	<DL
29	Bologna (beef/pork)	<DL	<DL	<DL	<DL
30	Salami, luncheon-meat type (not hard)	<DL	<DL	<DL	<DL
34	Fish sticks or patty, frozen, oven-cooked	<DL	<DL	<DL	<DL
35	Eggs, scrambled w/ oil	<DL	<DL	<DL	<DL
37	Eggs, boiled	<DL	<DL	<DL	<DL
38	Pinto beans, dry, boiled	<DL	<DL	<DL	<DL
39	Pork and beans, canned	<DL	<DL	<DL	<DL
42	Lima beans, immature, frozen, boiled	<DL	<DL	<DL	<DL
46	Peas, green, frozen, boiled	<DL	<DL	<DL	<DL
47	Peanut butter, creamy	<DL	<DL	<DL	<DL
48	Peanuts, dry roasted, salted	<DL	<DL	<DL	<DL
50	Rice, white, enriched, cooked	<DL	<DL	<DL	<DL
51	Oatmeal, plain, cooked	<DL	<DL	<DL	<DL
52	Cream of wheat (farina), enriched, cooked	<DL	<DL	<DL	<DL
53	Corn/hominy grits, enriched, cooked	<DL	<DL	<DL	<DL
54	Corn, fresh/frozen, boiled	<DL	<DL	<DL	<DL
55	Corn, canned	<DL	<DL	<DL	<DL
58	Bread, white, enriched	<DL	<DL	<DL	<DL
60	Cornbread, homemade	<DL	<DL	<DL	<DL
61	Biscuits, refrigerated-type, baked	<DL	<DL	<DL	<DL
62	Bread, whole wheat	<DL	<DL	<DL	<DL
63	Tortilla, flour	<DL	<DL	<DL	<DL
64	Bread, rye	<DL	<DL	<DL	<DL
65	Muffin, fruit or plain	<DL	<DL	<DL	<DL
66	Crackers, saltine	<DL	<DL	<DL	<DL
67	Corn/tortilla chips	<DL	<DL	<DL	<DL

Table 8 Continued

Food No.	Food Description	PCB Concentration (ppm)			
		Study Period 1	Study Period 2	Study Period 3	Study Period 4
69	Noodles, egg, enriched, boiled	<DL	<DL	<DL	<DL
71	Corn flakes cereal	<DL	<DL	<DL	<DL
72	Fruit-flavored cereal, presweetened	<DL	<DL	<DL	<DL
73	Shredded wheat cereal	<DL	<DL	<DL	<DL
74	Raisin bran cereal	<DL	<DL	<DL	<DL
75	Crisped rice cereal	<DL	<DL	<DL	<DL
76	Granola w/ raisins	<DL	<DL	<DL	<DL
77	Oat ring cereal	<DL	<DL	<DL	<DL
78	Apple (red), raw (w/ peel)	<DL	<DL	<DL	<DL
79	Orange (navel/Valencia), raw	<DL	<DL	<DL	<DL
80	Banana, raw	<DL	<DL	<DL	<DL
81	Watermelon, raw/frozen	<DL	<DL	<DL	<DL
83	Peach, raw/frozen	<DL	<DL	<DL	<DL
84	Applesauce, bottled	<DL	<DL	<DL	<DL
85	Pear, raw (w/ peel)	<DL	<DL	<DL	<DL
86	Strawberries, raw/frozen	<DL	<DL	<DL	<DL
87	Fruit cocktail, canned in light syrup	<DL	<DL	<DL	<DL
88	Grapes (red/green), raw	<DL	<DL	<DL	<DL
89	Cantaloupe, raw/frozen	<DL	<DL	<DL	<DL
92	Grapefruit, raw	<DL	<DL	<DL	<DL
93	Pineapple, canned in juice	<DL	<DL	<DL	<DL
95	Raisins	<DL	<DL	<DL	<DL
97	Avocado, raw	<DL	<DL	<DL	<DL
98	Orange juice, frozen conc, reconstituted	<DL	<DL	<DL	<DL
99	Apple juice, bottled	<DL	<DL	<DL	<DL
100	Grapefruit juice, frozen conc, reconstituted	<DL	<DL	<DL	<DL
103	Prune juice, bottled	<DL	<DL	<DL	<DL
105	Lemonade, frozen conc, reconstituted	<DL	<DL	<DL	<DL
107	Spinach, fresh/frozen, boiled	<DL	<DL	<DL	<DL
108	Collards, fresh/frozen, boiled	<DL	<DL	<DL	<DL
109	Lettuce, iceberg, raw	<DL	<DL	<DL	<DL
110	Cabbage, fresh, boiled	<DL	<DL	<DL	<DL
113	Broccoli, fresh/frozen, boiled	<DL	<DL	<DL	<DL
114	Celery, raw	<DL	<DL	<DL	<DL
115	Asparagus, fresh/frozen, boiled	<DL	<DL	<DL	<DL
116	Cauliflower, fresh/frozen, boiled	<DL	<DL	<DL	<DL
117	Tomato, raw	<DL	<DL	<DL	<DL
119	Tomato sauce, plain, bottled	<DL	<DL	<DL	<DL
121	Green beans, fresh/frozen, boiled	<DL	<DL	<DL	<DL
122	Green beans, canned	<DL	<DL	<DL	<DL
123	Cucumber, peeled, raw	<DL	<DL	<DL	<DL
124	Summer squash, fresh/frozen, boiled	<DL	<DL	<DL	<DL
125	Pepper, sweet, green, raw	<DL	<DL	<DL	<DL
126	Squash, winter (Hubbard/acorn), fresh/frozen, boiled	<DL	<DL	<DL	<DL
128	Onion, mature, raw	<DL	<DL	<DL	<DL

Table 8 Continued

Food No.	Food Description	PCB Concentration (ppm)			
		Study Period 1	Study Period 2	Study Period 3	Study Period 4
131	Beets, canned	<DL	<DL	<DL	<DL
136	Potato, boiled (w/out peel)	<DL	<DL	<DL	<DL
137	Potato, baked (w/ peel)	<DL	<DL	<DL	<DL
138	Potato chips	<DL	<DL	<DL	<DL
142	Spaghetti w/ meat sauce, homemade	<DL	<DL	<DL	<DL
145	Chili con carne w/ beans, canned	<DL	<DL	<DL	<DL
146	Macaroni and cheese, prepared from box mix	<DL	<DL	<DL	<DL
147	Quarter-pound hamburger on bun, fast-food	<DL	<DL	<DL	<DL
148	Meatloaf, beef, homemade	<DL	<DL	<DL	<DL
152	Chicken potpie, frozen, heated	<DL	<DL	<DL	<DL
155	Soup, chicken noodle, canned, cond, prep w/ water	<DL	<DL	<DL	<DL
156	Soup, tomato, canned, cond, prep w/water	<DL	<DL	<DL	<DL
157	Soup, vegetable beef, canned, cond, prep w/ water	<DL	<DL	<DL	<DL
161	Dill cucumber pickles	<DL	<DL	<DL	<DL
162	Margarine, regular (salted)	<DL	<DL	<DL	<DL
164	Butter, regular (salted)	<DL	<DL	<DL	<DL
166	Mayonnaise, regular, bottled	<DL	<DL	<DL	<DL
167	Half & half cream	<DL	<DL	<DL	<DL
168	Cream substitute, non-diary, liquid/frozen	<DL	<DL	<DL	<DL
169	Sugar, white, granulated	<DL	<DL	<DL	<DL
170	Syrup, pancake	<DL	<DL	<DL	<DL
172	Honey	<DL	<DL	<DL	<DL
173	Tomato catsup	<DL	<DL	<DL	<DL
177	Ice cream, light, vanilla	<DL	<DL	<DL	<DL
178	Cake, chocolate w/ icing	<DL	<DL	<DL	<DL
182	Sweet roll/Danish pastry	<DL	<DL	<DL	<DL
183	Chocolate chip cookies	<DL	<DL	<DL	<DL
184	Sandwich cookies w/ crème filling	<DL	<DL	<DL	<DL
185	Apple pie, fresh/frozen	<DL	<DL	<DL	<DL
186	Pumpkin pie, fresh/frozen	<DL	<DL	<DL	<DL
187	Candy bar, milk chocolate, plain	<DL	<DL	<DL	<DL
190	Gelatin dessert, any flavor	<DL	<DL	<DL	<DL
191	Carbonated beverage, cola, regular	<DL	<DL	<DL	<DL
193	Fruit drink, from powder	<DL	<DL	<DL	<DL
194	Carbonated beverage, cola, low-calorie	<DL	<DL	<DL	<DL
197	Tea, from tea bag	<DL	<DL	<DL	<DL
198	Beer	<DL	<DL	<DL	<DL
199	Wine, dry table, red/ white	<DL	<DL	<DL	<DL
202	Infant formula, milk-based, high iron, RTF	<DL	<DL	<DL	<DL
203	Infant formula, milk-based, low iron, RTF	<DL	<DL	<DL	<DL
205	BF, beef and broth/gravy	<DL	<DL	<DL	<DL
207	BF, chicken and broth/gravy	<DL	<DL	<DL	<DL

Table 8 Continued

Food No.	Food Description	PCB Concentration (ppm)			
		Study Period 1	Study Period 2	Study Period 3	Study Period 4
211	BF, vegetables and beef	<DL	<DL	<DL	<DL
212	BF, vegetables and chicken	<DL	<DL	<DL	<DL
213	BF, vegetables and ham	<DL	<DL	<DL	<DL
214	BF, chicken noodle dinner	<DL	<DL	<DL	<DL
215	BF, macaroni, tomato and beef	<DL	<DL	<DL	<DL
216	BF, turkey and rice	<DL	<DL	<DL	<DL
218	BF, carrots	<DL	<DL	<DL	<DL
219	BF, green beans	<DL	<DL	<DL	<DL
220	BF, mixed vegetables	<DL	<DL	<DL	<DL
221	BF, sweet potatoes	<DL	<DL	<DL	<DL
223	BF, peas	<DL	<DL	<DL	<DL
225	BF, applesauce	<DL	<DL	<DL	<DL
226	BF, peaches	<DL	<DL	<DL	<DL
227	BF, pears	<DL	<DL	<DL	<DL
230	BF, juice, apple	<DL	<DL	<DL	<DL
231	BF, juice, orange	<DL	<DL	<DL	<DL
232	BF, vanilla custard/pudding	<DL	<DL	<DL	<DL
233	BF, fruit dessert/pudding	<DL	<DL	<DL	<DL
235	Yogurt, lowfat, fruit-flavored	<DL	<DL	<DL	<DL
236	Cheese, Swiss, natural	<DL	<DL	<DL	<DL
237	Cream cheese	<DL	<DL	<DL	<DL
239	Luncheon meat (ham)	<DL	<DL	<DL	<DL
240	Chicken breast, oven-roasted (skin removed)	<DL	<DL	<DL	<DL
241	Chicken nuggets, fast-food	<DL	<DL	<DL	<DL
244	Shrimp, boiled	<DL	<DL	<DL	<DL
248	Bread, cracked wheat	<DL	<DL	<DL	<DL
249	Bagel, plain, toasted	<DL	<DL	<DL	<DL
250	English muffin, plain, toasted	<DL	<DL	<DL	<DL
251	Crackers, graham	<DL	<DL	<DL	<DL
252	Crackers, butter-type	<DL	<DL	<DL	<DL
254	Peach, canned in light/medium syrup	<DL	<DL	<DL	<DL
255	Pear, canned in light syrup	<DL	<DL	<DL	<DL
256	Pineapple juice, frozen conc, reconstituted	<DL	<DL	<DL	<DL
257	Grape juice, frozen conc, reconstituted	<DL	<DL	<DL	<DL
258	Potato, french-fried, fast-food	<DL	<DL	<DL	<DL
259	Carrot, fresh, peeled, boiled	<DL	<DL	<DL	<DL
261	Tomato juice, bottled	<DL	<DL	<DL	<DL
263	Brussels sprouts, fresh/frozen, boiled	<DL	<DL	<DL	<DL
264	Mushrooms, raw	<DL	<DL	<DL	<DL
265	Eggplant, fresh, peeled, boiled	<DL	<DL	<DL	<DL
266	Turnip, fresh/frozen, boiled	<DL	<DL	<DL	<DL
267	Okra, fresh/frozen, boiled	<DL	<DL	<DL	<DL
268	Mixed vegetables, frozen, boiled	<DL	<DL	<DL	<DL
269	Beef stroganoff w/ noodles, homemade	<DL	<DL	<DL	<DL
272	Tuna noodle casserole, homemade	<DL	<DL	<DL	<DL

Table 8 Continued

Food No.	Food Description	PCB Concentration (ppm)			
		Study Period 1	Study Period 2	Study Period 3	Study Period 4
275	Quarter-pound cheeseburger on bun, fast-food	<DL	<DL	<DL	<DL
276	Fish sandwich on bun, fast-food	<DL	<DL	<DL	<DL
278	Egg, cheese, and ham on English muffin, fast-food	<DL	<DL	<DL	<DL
279	Taco/tostada w/ beef and cheese, from Mexican carry-out	<DL	<DL	<DL	<DL
281	Pizza, cheese and pepperoni, regular crust, from pizza carry-out	<DL	<DL	<DL	<DL
283	Soup, bean w/ bacon/pork, canned, cond, prep w/ water	<DL	<DL	<DL	<DL
285	Clam chowder, New England, canned, cond, prep w/ whl milk	<DL	<DL	<DL	<DL
286	Ice cream, regular, vanilla	<DL	<DL	<DL	<DL
287	Sherbet, fruit-flavored	<DL	<DL	<DL	<DL
288	Popsicle, fruit-flavored	<DL	<DL	<DL	<DL
290	Doughnut, cake-type, any flavor	<DL	<DL	<DL	<DL
291	Brownie	<DL	<DL	<DL	<DL
292	Sugar cookies	<DL	<DL	<DL	<DL
293	Candy, hard, any flavor	<DL	<DL	<DL	<DL
294	Pretzels, hard, salted	<DL	<DL	<DL	<DL
295	Syrup, chocolate	<DL	<DL	<DL	<DL
296	Jelly, any flavor	<DL	<DL	<DL	<DL
298	Yellow mustard	<DL	<DL	<DL	<DL
299	Black olives	<DL	<DL	<DL	<DL
300	Sour cream	<DL	<DL	<DL	<DL
305	Coffee, from ground	<DL	<DL	<DL	<DL
306	Carbonated beverage, fruit-flavored, reg	<DL	<DL	<DL	<DL
307	Fruit drink (10% juice), canned or bottled	<DL	<DL	<DL	<DL
309	Infant formula, soy-based, RTF	<DL	<DL	<DL	<DL
313	BF, bananas	<DL	<DL	<DL	<DL
317	BF, teething biscuits	<DL	<DL	<DL	<DL
318	Salmon, steaks/fillets, baked	0.038	0.016	0.022	0.045
320	BF, squash	<DL	<DL	<DL	<DL
323	BF, cereal, oatmeal, dry, prep w/ water	<DL	<DL	<DL	<DL
324	BF, cereal, rice, dry, prep w/ water	<DL	<DL	<DL	<DL
325	BF, cereal, rice w/apples, dry, prep w/ water	<DL	<DL	<DL	<DL
326	BF, veal and broth/gravy	<DL	<DL	<DL	<DL
327	BF, lamb and broth/gravy	<DL	<DL	<DL	<DL
328	BF, turkey and broth/gravy	<DL	<DL	<DL	<DL
331	Meal replacement, liquid RTD, any flavor	<DL	<DL	<DL	<DL
332	Cottage cheese, creamed, lowfat (2% milk fat)	<DL	<DL	<DL	<DL
333	Sour cream dip, any flavor	<DL	<DL	<DL	<DL
334	Beef steak, loin/sirloin, broiled	<DL	<DL	<DL	<DL

Table 8 Continued

Food No.	Food Description	PCB Concentration (ppm)			
		Study Period 1	Study Period 2	Study Period 3	Study Period 4
335	Luncheon meat (chicken/turkey)	<DL	<DL	<DL	<DL
336	Chicken breast, fried, fast-food (w/ skin)	<DL	<DL	<DL	<DL
337	Chicken thigh, oven-roasted (skin removed)	<DL	<DL	<DL	<DL
338	Chicken leg, fried, fast-food (w/ skin)	<DL	<DL	<DL	<DL
339	Catfish, pan-cooked w/ oil	<DL	0.017	<DL	<DL
340	Tuna, canned in water, drained	<DL	<DL	<DL	<DL
341	Refried beans, canned	<DL	<DL	<DL	<DL
342	White beans, dry, boiled	<DL	<DL	<DL	<DL
343	Sunflower seeds (shelled), roasted, salted	<DL	<DL	<DL	<DL
344	Pancakes, frozen, heated	<DL	<DL	<DL	<DL
345	Breakfast tart/toaster pastry	<DL	<DL	<DL	<DL
346	Macaroni salad, from grocery/deli	<DL	<DL	<DL	<DL
347	Spaghetti, enriched, boiled	<DL	<DL	<DL	<DL
348	Apricots, canned in heavy/light syrup	<DL	<DL	<DL	<DL
350	Fruit juice blend (100% juice), canned/bottled	<DL	<DL	<DL	<DL
351	Cranberry juice cocktail, canned/bottled	<DL	<DL	<DL	<DL
352	Orange juice, bottled/carton	<DL	<DL	<DL	<DL
353	Potato salad, mayonnaise-type, from grocery/deli	<DL	<DL	<DL	<DL
354	Potato, mashed, prepared from fresh	<DL	<DL	<DL	<DL
355	Coleslaw, mayonnaise-type, from grocery/deli	<DL	<DL	<DL	<DL
356	Carrot, baby, raw	<DL	<DL	<DL	<DL
357	Lettuce, leaf, raw	<DL	<DL	<DL	<DL
358	Sweet potatoes, canned	<DL	<DL	<DL	<DL
359	Tomato salsa, bottled	<DL	<DL	<DL	<DL
360	Beef and vegetable stew, canned	<DL	<DL	<DL	<DL
361	Lasagna w/ meat, frozen, heated	<DL	<DL	<DL	<DL
362	Beef w/ vegetables in sauce, from Chinese carry-out	<DL	<DL	<DL	<DL
363	Chicken w/ vegetables in sauce, from Chinese carry-out	<DL	<DL	<DL	<DL
364	Fried rice, meatless, from Chinese carry-out	<DL	<DL	<DL	<DL
365	Burrito w/ beef, beans and cheese, from Mexican carry-out	<DL	<DL	<DL	<DL
366	Chicken filet (broiled) sandwich on bun, fast-food	<DL	<DL	<DL	<DL
367	Soup, Oriental noodles (ramen noodles), prep w/ water	<DL	<DL	<DL	<DL
368	Pudding, ready-to-eat, flavor other than chocolate	<DL	<DL	<DL	<DL
369	Cake, yellow w/ icing	<DL	<DL	<DL	<DL
370	Granola bar, w/ raisins	<DL	<DL	<DL	<DL

Table 8 Continued

Food No.	Food Description	PCB Concentration (ppm)			
		Study Period 1	Study Period 2	Study Period 3	Study Period 4
371	Candy bar, chocolate, nougat, and nuts	<DL	<DL	<DL	<DL
372	Popcorn, microwave, butter-flavored	<DL	<DL	<DL	<DL
373	Sweet & sour sauce	<DL	<DL	<DL	<DL
374	Brown gravy, canned or bottled	<DL	<DL	<DL	<DL
375	Salad dressing, creamy/buttermilk type, regular	<DL	<DL	<DL	<DL
376	Salad dressing, creamy/buttermilk type, low-calorie	<DL	<DL	<DL	<DL
377	Salad dressing, Italian, regular	<DL	<DL	<DL	<DL
378	Olive oil	<DL	<DL	<DL	<DL
379	Vegetable oil	<DL	<DL	<DL	<DL
380	Bottled drinking water (mineral/spring), not carbonated or flavored	<DL	<DL	<DL	<DL
381	Decaffeinated coffee, from ground	<DL	<DL	<DL	<DL
382	Decaffeinated tea, from tea bag	<DL	<DL	<DL	<DL
700	BF, cereal, barley, dry, prep w/water	<DL	<DL	<DL	<DL
701	BF, cereal, mixed, dry, prep w/water	<DL	<DL	<DL	<DL
703	BF, juice, apple-banana	<DL	<DL	<DL	<DL
704	BF, juice, apple-cherry	<DL	<DL	<DL	<DL
705	BF, juice, apple-grape	<DL	<DL	<DL	<DL
710	BF, juice, mixed fruit	<DL	<DL	<DL	<DL
711	BF, juice, pear	<DL	<DL	<DL	<DL
712	BF, juice, grape	<DL	<DL	<DL	<DL
713	BF, pears and pineapple	<DL	<DL	<DL	<DL
714	BF, plums w/ apples and/or pears	<DL	<DL	<DL	<DL
715	BF, bananas and pineapple	<DL	<DL	<DL	<DL
717	BF, apricots w/ mixed fruit	<DL	<DL	<DL	<DL
719	BF, banana dessert	<DL	<DL	<DL	<DL
720	BF, peach cobbler/dessert	<DL	<DL	<DL	<DL
721	BF, fruit yogurt dessert	<DL	<DL	<DL	<DL
722	BF, dutch apple/apple cobbler	<DL	<DL	<DL	<DL
723	BF, arrowroot cookies	<DL	<DL	<DL	<DL
724	BF, zweiback toast	<DL	<DL	<DL	<DL
725	BF, cereal, oatmeal w/fruit, prep w/water	<DL	<DL	<DL	<DL
726	BF, chicken w/ rice	<DL	<DL	<DL	<DL
727	BF, beef and noodles/beef stroganoff	<DL	<DL	<DL	<DL
728	BF, vegetables and turkey	<DL	<DL	<DL	<DL
729	BF, macaroni and cheese	<DL	<DL	<DL	<DL
730	BF, apples with berries	<DL	<DL	<DL	<DL
731	BF, apples w/ fruit other than berries	<DL	<DL	<DL	<DL
FDA	U.S. Food and Drug Administration				
PCB	polychlorinated biphenyl				
ppm	parts per million				
<DL	less than detection limit				

Table 9 Overview of PCB Concentrations in Air and Blood from a Study of PCB-contaminated Schools in Germany ¹					
	School 1	School 2	School 3	Control	Estabrook
PCBs in Air (ng/m ³)					
Average (max)	635 (1587)	7490 (10655)	3541 (10125)	NA	450 (1800)
PCBs in Serum (µg/L)					
PCB 28	0.045	0.098	0.057	0.035	NA
PCB 138	0.66				NA
PCB 153	0.95				NA
PCB 180	0.7				NA
Total PCBs	"Taken together the present results and observations of authors, it may be concluded that indoor air concentrations with PCB mixtures of low and medium chlorination, that are below 1,000 ng/m ³ have no observable effect to the PCB level of exposed individuals."				NA
PCB	polychlorinated biphenyl				
ng/m ³	nanograms per cubic meter				
NA	not available				
µg/L	micrograms per liter				
¹ Gabrio T, et al. 2000. PCB-blood levels in teachers, working in PCB-contaminated schools. <i>Chemosphere</i> 40: 1055-1062.					